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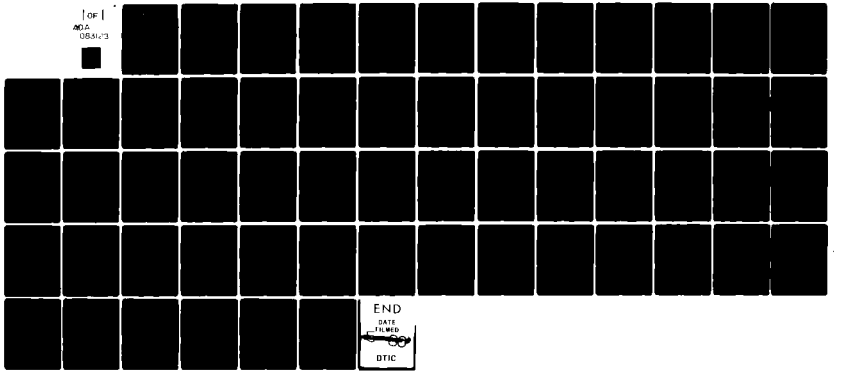

AMMRC TR 80-8

ANNUAL REPORT
MECHANICAL PROPERTIES DATA CENTER

MARCH 1980

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BATTELLE-COLUMBUS
Columbus, Ohio

ANNUAL REPORT — CONTRACT DLA900-79-C-0539

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Prepared for

ARMY MATERIALS AND MECHANICS RESEARCH CENTER
Watertown, Massachusetts 02172

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This report summarizes MPDC activities for the period 1 January 1979 through 31 December 1979, a total of 12 months, under Contract DLA900-79-C-0539. It provides a summary of the scope, objectives and organization of MPDC, its information processing products, and services, and a discussion of management objectives. The report focuses on the start-up of MPDC and the conversion of the mechanical properties data base to the Battelle data base management system engendered by the change of contractors.

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SUMMARY

The operation of the Mechanical Properties Data Center (MPDC) was undertaken by Battelle's Columbus Laboratories under Contract No. DLA900-79-C-0539, effective 1 January 1979. Prior to the award of this contract to Battelle, the Center was operated by another contractor since its inception in 1960.

This full-service Center is sponsored by the Department of Defense as one of several Information Analysis Centers (IAC) providing available scientific and technical information and data on selected materials of interest to the DoD and the technical community at large. This Center is primarily concerned with the maintenance of a mechanical properties data bank on high-strength metals.

During this first year, the main effort was directed toward the conversion of the numeric mechanical properties data base to the Battelle system, and the establishment of management and administrative services. Related information activities were directed toward integration of the MPDC bibliographic data with the MCIC records to minimize duplication.

Other accomplishments of the first year of operation were:

(1) The sales and maintenance of the Handbooks—*Aerospace Structural Metals Handbook, Structural Alloys Handbook,* and *Alloy Cross Index*—were continued with a minimum of interruption.

(2) Technical inquiries were handled without the benefit of the MPDC numeric data base—through Handbooks or MCIC facilities.

(3) A Promotion and Marketing effort was started and will be continued to meet the operational goals established by DoD.

Future plans are for the completion of the data base conversion and the continuation and expansion of products and services to the extent that time and funds permit.

PREFACE

This report was prepared by the Mechanical Properties Data Center (MPDC) which is operated by Battelle's Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201, under Contract DLA900-79-C-0539. The MPDC program has been administered under the direction of the Defense Logistics Agency (Mr. Joseph Blue) with technical supervision by the Army Materials and Mechanics Research Center, Watertown, Massachusetts, Mr. Samuel Valencia, Contracting Officer's Technical Representative. Contractual matters are administered by the Defense Electronics Supply Center (Mrs. F. Burke), Dayton, Ohio.

This Annual Report covers the period of work from 1 January through 31 December 1979. The Fourth Quarter statistics (October through December 1979) are also included.

The MPDC and Battelle management express their appreciation to the former contractor, Belfour-Stulen Incorporated, Traverse City, Michigan, for their prior efforts which have established the reputation which MPDC's products and services now enjoy. Their prompt response to requests at the initiation of this contract under less-than-optimum conditions is truly appreciated.

ANNUAL REPORT
(January, 1979 through December, 1979)

and

Fourth Quarterly Progress Report
(October through December, 1979)

on the

OPERATION OF THE MECHANICAL PROPERTIES DATA CENTER

to

ARMY MATERIALS AND MECHANICS RESEARCH CENTER

INTRODUCTION

The present contract for the operation of the Mechanical Properties Data Center (MPDC) was awarded to Battelle's Columbus Laboratories effective January 1, 1979. A maximum of five years of Battelle's operation of MPDC are covered under this contract. This full-service Information Analysis Center (IAC) is sponsored by the Department of Defense with technical direction from the Army Materials and Mechanics Research Center (AMMRC) and administrative management by the Defense Logistics Agency (DLA).

The efforts of the first year have been concerned primarily with the conversion of the data base (received from the previous contractor) to the Battelle system, and the establishment of management and administrative services. This start-up effort is necessary to maintain competence as a source of mechanical properties data as well as to achieve the financial goals of added support through the sale of products and services. Except for the conversion of the numeric data base, progress has been generally according to schedule. In order to provide an easily accessible, non-redundant, flexible system, the entire numeric data base is being reformatted. This conversion from the format used by the previous contractor to the Battelle BASIS Data Base Management System has been hampered by a lack of adequate documentation.

Although the data base conversion problems have required more time and effort than anticipated, the sales and maintenance of the two handbooks (*Aerospace Structural Metals Handbook* and *Structural Alloys Handbook*) were continued by the Center. A review of the bibliographic information received from the previous contractor was initiated to check for MCIC/MPDC duplication; review of new documents with new data for possible inclusion in the MPDC numeric data bank was also initiated.

Scope and Purposes of MPDC

The objective of MPDC's operation is to increase the productivity of scientists, engineers, and technicians engaged in scientific and engineering programs for the Department of Defense. As with other government-funded IACs, the services and products of MPDC are available to all U.S. government agencies and their contractors and to the industrial and academic communities in the private sector.

The materials within MPDC's competence and concern include structural materials (primarily high-strength metals) for DoD applications and uses in the aerospace and defense industries. The Center collects and provides its users with mechanical properties and related materials characterization data for many alloy systems under a variety of test conditions.

To accomplish these objectives in the first year the MPDC program consisted of the following functions:

1. Conversion of the mechanical properties numeric data base to the Battelle format for use with the BASIS data base management system

2. Integration of the bibliographic data into the DTIC system and establishment of the procedures for the maintenance of a comprehensive, up-to-date, authoritative technical information base

3. Responses to requests for technical assistance from data base users

4. Issuance of several announcements covering the change of contractors and the status of MPDC

5. Maintenance and updating of the *Aerospace Structural Metals Handbook* and the *Structural Alloys Handbook*

6. Entry of the *Alloy Cross Index* on the Battelle computer, printing of copies for sale, and examination of contents and format.

Organization of the MPDC Program

The Mechanical Properties Data Center is assigned to the Materials Information Program Office of Battelle's Columbus Laboratories. Because of the similarities in scopes, management of MCIC and MPDC have been assigned to the manager of that Program Office to ensure cost-effective operation of both Centers. This has been accomplished through avoidance of duplication of efforts in the two Centers and the effective utilization of systems and procedures established and optimized by MCIC staff. During the year reported herein, the equivalent of more than four full-time engineers, computer and information specialists, and support personnel were involved in undertaking the functions of the Center.

Key contributors to the operation of MPDC, their Departments, and functions were as follows:

Personnel	Function	Department
Harold Hucek Daniel Maykuth Rose Leibbrand	Coordination and Management of Marketing, Promotions, and Publications	Materials Materials Computer, Information Systems and Education
Ross Gubiotti Keith Smoak Donald Moon	Conversion of the data base and related programming	Computer, Information Systems and Education
Helen Pestel	Coordination of Information Services	Computer, Information Systems and Education
Carl Jaske Ronald Favor	Mechanical Properties	Transportation and Structures
Dr. T. Leontis	Author of SAH Magnesium Section	Materials

INFORMATION OPERATIONS

The operation of MPDC entails two basic operations relative to the acquisition and input of source information:

1. Acquisition and review of documents for inclusion in both the bibliographic and numeric data bases.

2. Extraction of numeric mechanical properties data from relevant documents and entering of that data into the computerized data base.

Before these operations could be undertaken as "routine", the material received from the previous contractor had to be duplication checked against the MCIC collection and, where appropriate, tagged as MPDC references. In addition, a major effort was directed toward the conversion of the data base into the Battelle system which utilizes BASIS as the Data Base Management System.

This section describes both activities undertaken as part of the start-up of MPDC at Battelle.

Bibliographic Data – Acquisition and Input

The information acquisition program for MPDC is coordinated with this same activity for the Metals and Ceramics Information Center (MCIC) in order to minimize the cost and duplication of this function for both programs. Incoming documents, screened with this in mind, are tagged for processing into the relevant Center and in some cases for processing into both Centers.

During the Fourth Quarter, 1151 documents were acquired and reviewed for input into the MCIC/MPDC Bibliography Data Base on the Defense RDT&E On-Line System. Of these, 1015 (88.2 percent) were added to the Bibliographic Data Base. For MPDC, 137 documents (14.5 percent of those added to the MCIC/MPDC Bibliographic Data Base) have been tagged for review by the mechanical properties specialists for possible input into the Numeric Data Base on the BASIS File. Corresponding values for the year are: 4207 documents acquired; 3779 (89.8 percent) documents added to the Bibliographic Data Base; and 547 (14.5 percent) tagged for review for the Numeric Data Base. A breakdown of the type and number of documents added to the Bibliographic Data Base and tagged for the Numeric Data Base is shown in Table 1.

During the year, the approximately 3500 documents in the MPDC numeric data file furnished by the previous contractor were duplication checked against the MCIC collection. The duplication checking has been hampered by incomplete or inaccurate titles appearing on the printout of the MPDC holdings. During the second and third quarters, about 70 percent of the references not already in the MCIC collection were accessioned and added to the Bibliographic Data Base on the Defense RDT&E On-Line System. During the fourth quarter, 212 documents were added—giving a total of 332 documents for the year. (Table 1 is a summary of the types of documents processed in the fourth quarter and the full year.) Documents in the MPDC collection can be isolated from the total MCIC collection by specifying the term "?48MPDC" or "M--MPDC" as one level of search question for the MCIC collection on the Defense RDT&E On-Line System. This system minimizes or eliminates duplication of references in the RDT&E System and the need for a separate MPDC library.

During the coming quarter, the remaining documents from the MPDC numeric data file not already in the MCIC Data Base will be processed into the Bibliographic Data Base. (Receipt of a second CRT terminal in 1980 will aid this effort.)

Data Base Operations

When the original (proposed) schedule was established, it was assumed that the input data to be received as the basis for the mechanical properties data bank would be fully documented in a form (magnetic tape) and format that could be handled, understood readily, and reformatted easily. This assumption turned out to be only partially correct. The input data tapes, received during the second week of the program (January, 1979), contained a series of interrelated files that used a highly complex coding scheme both to store data within records and to relate information between records. (A record is defined as a logical grouping of data related to one data point such as mechanical properties and material characterization.) This, in conjunction with the lack of sufficiently detailed documentation, necessitated extensive, detailed examination of the data base. An immediate result was the need to write a series of computer programs to reformat the data into a form acceptable for entry into the Battelle on-line system. The analysis for these computer programs required stepping through the former MPDC system, including the original program listing.

The following tasks were undertaken by the Information Systems Section to accomplish the data base conversion:

- Data Analysis and Reformat
  - Systems Analysis
  - Programming (Data Reformat)
  - Data Verification

TABLE 1. BIBLIOGRAPHIC AND NUMERIC FILE INPUT

Document Type	MPDC/MCIC Bibliographic File Input				New Documents Tagged for MPDC Numeric File				Old MPDC Documents Added to Bibliographic File			
	4th Quarter		Contract Year		4th Quarter		Contract Year		4th Quarter		Contract Year	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Journal Articles	409	40.3	1858	49.2	61	44.5	294	53.6	1	0.5	1	0.3
Technical Reports												
DOD												
Air Force	114	11.2	446	11.8	12	8.8	48	8.8	47	22.2	72	21.7
Army	76	7.5	183	4.8	3	2.2	14	2.6	37	17.4	60	18.1
Navy	118	11.6	395	10.4	10	7.3	33	6.0	57	26.9	103	31.0
Other	99	9.7	154	4.1	16	11.7	24	4.4	69	32.5	95	28.6
Non-DOD												
DOE/ERDA	29	2.9	107	2.8	8	5.8	20	3.7	0	0	0	0
NASA	31	3.0	151	4.0	4	2.9	25	4.6	1	0.5	1	0.3
Other	22	2.2	74	2.0	6	4.4	25	4.6	0	0	0	0
Technical Papers	101	10.0	377	10.0	15	10.9	58	10.6	0	0	0	0
Miscellaneous	16	1.6	34	0.9	2	1.5	6	1.1	0	0	0	0
TOTAL	1015	100.0	3779	100.0	137	100.0	547	100.0	212	100.0	332	100.0

- BASIS Conversion
  - Data Base Design
  - Programming (Conversion)
  - Data Validation
  - Updates
  - Programming (Report Generation)
- Input Sheet Design
- SAH/ASMH Customer List Conversion
- MCIC Duplication Checking.

The total (person-hour) efforts expended during the first year to accomplish these tasks are summarized in Appendix A (Table A-1). Because of the extent of these efforts, other tasks have been affected. (Table A-1 also includes the general support for other computer-related operations discussed in this report.)

Starting with the following MPDC files and related information received from the previous contractor, the efforts described in subsequent sections were undertaken:

a. Magnetic Tapes - 8 Data tapes
   2 Bibliographic/Index tapes
   3 Tapes with file conversion data
   1 Alloy Cross Index tape
   1 JCL/Program tape

b. Procedure Run Books - 7 (including 1 duplicate)

c. Listings - 1 File conversion data
   7 Bibliographic Index data
   1 (set) Alloy Cross Index
   1 Data inventory
   1 Program Listings (and JCL)

d. Log Books - 4

e. Miscellaneous forms/art work - 1 package.

Data Analysis and Reformat

System Analysis. System analysis, the main portion of which began in January and lasted through March, consisted of reviewing the material provided by the previous contractor. This included analysis and study of the run manuals, cross-checking data formats between the run manuals and the data tapes, identifying the coding techniques used, and identifying the file interrelationships.

The problems/delays that occurred during this transition to the new file design stemmed from the large number of different formats in the previous computer system. There were 66 different data formats across 9 different file formats. Since it would have been extremely complex to convert all

of the different formats simultaneously, a step-wise conversion plan was chosen. In that way, a select group of data could be converted at any one time. Only minor modifications to the programs would then be required for each succeeding group. Although this was a more lengthy process than a single conversion of all data, there was far less chance of error in the reassembly and condensation of the data.

The BASIS system analysis could not proceed until the analysis of the previous system was completed and the data content and format were clearly understood. Only after this understanding was obtained could the BASIS conversion programs be written to handle the MPDC data in a reconstituted form. As an example of one major problem in this analysis, the original MPDC record format consisted of over 3300 fields for 33 defined tests; the new record structure was designed to eliminate almost all of the duplication and possible redundancies in the 3300 fields by combining similar data into compact records.

Because of the severe differences in formats across the test types, a major decision was made in March to concentrate on establishing a data base starting with the tension test data only. The other test data would then be converted in sections according to test type. This was done because the time and cost of a single-step conversion would have further delayed the start of the BASIS programming. The test-by-test conversion permitted partial access to some of the data base and simplified the programming of the different test-type/record-format combinations. After the determination was made to limit the data to tension test data, the constant cross checking to be certain that all codes and variations were accounted for caused a major delay in the completion of the conversion of the first set of (tension) data.

Programming (Data Reformat). After the analysis of the input material, the data from the various files were reformatted into records taht simulated the original documents. To accomplish this, a series of programs to extract, merge, and expand the data records were written and later modified, depending upon various test types. The output of these programs was the input records into the BASIS data base conversion preprocessing program. This effort, which began in March, consisted of writing, testing and executing (with test data) the following programs:

1. Data Extraction (PDATA) - selected subsets of data to be processed by subsequent programs. Variations and modifications of the program were used according to data card or test type.

2. Data Merge (PMERGE and BMERGE) - merged the different card types into single records. PMERGE handled the merger of processing data with test data, while BMERGE handled the merger of composition data with the heat-treatment data. Each program used a different criteria for combining the records so that two distinct programs were required.

3. Data Merge (PSQUZ) - merged the output from the PMERGE and BMERGE programs. At the same time, data having similar processing histories were combined into single records. This step reduced (by about 50 percent) the total number of records in the system and made the resultant system more efficient.

4. Data Conversion (MCONVT) - converted the coded information into a form that could be utilized by BASIS (another program with similar function is described in the BASIS Conversion Section). This program converted the coded numeric data according to predefined tables and established the decimal position and sign of each piece of numeric data.

5. Bibliographic Extraction (MDUMP) - extracted the bibliographic data for the documents used in the MPDC System and assigned the corresponding Battelle reference number (MCIC Reference Number).

6. Bibliographic Reformat (MRFMT) - combined documents with similar MPDC reference numbers (i.e., multi-volume references) for one-to-one correspondence between the bibliographic data and the records in the MPDC system.

7. Code Description Reformat (DESC) - reassembled the Code-to-Text conversion tables from the MPDC tape. The output of this program was the combined test translation table that is used by the BASIS conversion program (described subsequently) to convert the coded text data on the input records.

It took over six months to resolve the problems and inconsistencies in the data as received. As a result, conversion of the data did not begin until July, 1979. At that time, the first of the test types was converted. By December 1979, 9 of the 33 tests were converted. This represents over 59 percent of the original data. It is anticipated that the remainder of the useful data will be converted in early 1980.

Data Verification. After the initial test data were assembled into a format that simulated the original input, original documents were randomly selected and the data verified. This process consisted of checking each data point in the reconstructed computer record against the original document. (See Section on Data Validation for results of further cross checking.)

BASIS Conversion

System Design. The design of the data system started with the original MPDC pattern but eliminated the duplicated elements, compacted the record structure and simplified the field formats. (Although the major portion of this task was completed in March, it extended through June as modifications were made to the basic design.)

Appendix B presents some details and examples of the BASIS system.

Programming (Conversion). The final conversion programs to translate the coded text became more complex and time-consuming than anticipated. The different coding techniques necessitated a large cumbersome program to take the information from the coded data records and translate it into text. (The planning and analysis necessary to write this program began in April; the major writing and testing were done in May. Due to modifications in the BASIS file design, revisions to this program continued through the year.)

During May and June, the BASIS data base was updated twice with test data from the MPDC files. From this testing, the BASIS file design was refined and the data verified against the original documents (see Data Verification above). Also during this time, two major report programs were written to test the data base design.

Further modifications to BASIS are continuing to reflect changes required for each test type and related data formats.

Data Validation. During June, after the data base was updated using 3800 test data points, eight documents were chosen to verify that the reformatted records matched the data as contained in the documents. A second reason for the validation was to determine how complete a picture was represented by the original indexing of the documents.

The selected documents ranged from 1968 through 1977 and accounted for approximately 400 of the 3800 data points. Seven of the eight documents had their material characteristics and material processes indexed appropriately. The major problems found with those documents included missing or incorrect data and nonverified data. The last document, which accounted for over 200 data points, was poorly represented—all the composition data were missing and there was no indication of the processing history of the materials.

Random checking of data against the original reference documents will be continued. When new data are entered into the system, the data validation will be done immediately after the data are in the on-line system.

Updates. Since the conversion of the data base into the BASIS system has been proceeding by test type, the updates were not completed during the first year of the contract. The following is a summary of the number of records processed into the data base:

	Number of Records			
		Processed		
Record Type	Received	Fourth Quarter	Cumulative	Remaining
Data Records	812,319	62,817	465,813	346,506
Data Records-Continuation	172,470	3,381	38,928	133,542
Composition Data	128,657	Ø	122,094	6,563
Heat Treatment Data	95,129	Ø	95,129	Ø

By April 1980, the remaining tests—fatigue, bearing, input, fracture toughness, and noncyclic creep—will have been entered into the MPDC/BASIS System.

Programming (Report Generation). Specialized report formats are being designed and programs written to produce these reports. These report programs include interface programs to existing statistical programs for mechanical properties data analysis.

During this report year, programs have been written for the tabular presentation of data and some statistical analyses. Data analysis will be available according to specific test type in addition to the standard outputs available through the system.

Input Sheet Design

The design of an input sheet was completed to facilitate the transfer of data from pertinent references into the data base. A final review ensured that all tests could be handled with minimum problems. These printed sheets will be used for periodic updates of the data base (utilizing documents identified as containing MPDC input material).

SAH/ASMH Customer List Conversion

Two programs were written to access the data on the SAH/ASMH Customer List magnetic tape (*Structural Alloys Handbook/Aerospace Structural Metals Handbook*). The first program listed each customer—giving the status of the account; the second program produced mailing labels for product distribution.

The SAH/ASMH customer data base was subsequently built from the data on the Customer List magnetic tape and is now in operation. Data for new customers and for additions and changes to existing customers were entered onto input sheets, the information input into the data base during the first part of the last quarter of 1979.

MCIC Duplication Checking

Another major task undertaken during this period, the MCIC duplication checking, was not as difficult as it was time-consuming. Each MPDC reference was checked against existing MCIC documents for the insertion of an internal reference number. Inaccurate titles in the MPDC files required that over 25 percent of the documents be checked by fields other than by the title or by variations of the title field.

Included under this task is the continuing review of incoming MCIC documents to determine if those documents contain pertinent MPDC data. If so, the documents are handled as indicated in the Section on "Bibliographic Data". (The data will be extracted using the Input Sheets, also described earlier.)

HANDBOOKS AND DATA BOOKS

Material Received from Former Contractor

At the beginning of the contract, library documents, supplies of handbooks and miscellaneous records were received from the previous contractor. The packing list for the principal shipment received on January 25, 1979, is listed in Appendix C along with a brief description of the other materials received. All of the items described have been verified as having been received. According to the shipping containers the library reports received include documents A-0001 through A72910, B-00001 through B-01231 plus several old unnumbered reports called "Dead Sea Scrolls".

Publications

The MPDC publications program has historically consisted of three different documents:

1. Aerospace Structural Metals Handbook (ASMH)
2. Structural Alloys Handbook (SAH)
3. Alloys Cross Index (ACI).

Battelle has continued the ASMH as the major MPDC publication. For the first year of the contract, Battelle continued all publications in their present format while conducting an evaluation of their value to the technical community and their propriety to the Department of Defense/MPDC mission. The future of the SAH and ACI will be considered carefully with respect to available resources. Any changes in scope, format, or presentation of data will be discussed with the COTR.

The future technical content of all MPDC documents will be evaluated by technical experts from Battelle and outside groups such as trade organizations. For example, the chapters covering aluminum alloys from both the ASMH and the SAH have been sent to the Aluminum Association with a request for evaluation of the contents and suggestions for future supplements; copper alloy sections of the SAH are being discussed with the Copper Development Association.

The sales of documents and status of the handbooks are described in more detail in the following paragraphs.

Sales and Income

During the first 3 months of the current contract, letter invoices were sent to all customers (over 500) who had standing or automatic renewal orders for MPDC documents. This action plus other promotional measures resulted in a projected income to MPDC of $71,501 for 1979 for the first year of BCL operations of MPDC. Sales and income for the year and the fourth quarter of 1979 are shown in Table 2. The sales of handbooks should increase as the Battelle promotional program for MPDC matures and the proper audience for products is identified.

Aerospace Structural Metals Handbook (ASMH)

Available for distribution since March 1963, the ASMH has acquired a reputation as a reliable source of data on properties of aerospace materials. Battelle has maintained the supplementary service, consisting of four mailings per year to the subscribers. Because of the time required for the transition of operations from the previous contractor to Battelle, there have been some slight delays in mailings; hence, the fourth supplement for 1979 will be mailed in February 1980.

Upon initiation of this contract in January 1979, work in progress on 12 supplemental chapters to the ASMH was stopped and the manuscripts, in various stages of completion (as shown in Table 3) were shipped to Battelle. Because of the status of the chapters, it was possible to complete and ship the first supplement in April 1979—ahead of the anticipated schedule. Subsequent supplements for 1979 were completed and shipped as shown in Table 4. It is anticipated that all 1980 supplements will be mailed on schedule.

The five chapters listed in Table 3 which were partially completed at the start of the contract (IN-706, Incoloy 800H, 9-Ni Steel, HY-130 Steel, and Ti-3Al-2.5V) were completed by the authors who started them. This was the most cost-effective and expeditious way to complete these chapters.

The publication plan for 1980 and 1981 for the ASMH is listed in Table 5. The schedule listed in Table 5 is rather ambitious and depends upon the authors finishing on schedule and on funding limitations for MPDC.

TABLE 2. PROJECTED INCOME FROM FOURTH QUARTER AND ANNUAL SALES

Type of Handbook or Document	Handbooks or Documents Sold During 4th Quarter		Supplements Sold During 4th Quarter		Cumulative Sales Since January 1, 1979 (Present Contract)				Handbook or Documents Cumulative Number Sold
					Handbooks or Documents		Supplements		
	Number Sold	Income, dollars	Number Sold	Income, dollars	Number Sold	Income, dollars	Number Sold	Income, dollars	
ASMH	15	2,156.93	38	1,755	57	13,636.93	673	34,481.06	1,377
SAH	15	1,050.00	18	595	45	6,390.00	294	14,805.00	706
ACI	8	90.00	--	--	25	1,395.00	--	--	142
Binders, Misc.**	4	41.00	--	--	8	53.00	--	--	8
Totals	42	3,337.93	--	2,350	135	21,474.93	967	49,286.06	2,233

TOTAL INCOME FOR QUARTER ENDING DECEMBER 30, 1979 = $5,687.93
(Total Income for 1979, received at Battelle = $70,760.99 + $739.52 for miscellaneous and special mailing costs covered by purchaser.)

* $2,759 Income for 1979 was received by the previous contractor but has not been forwarded to Battelle and was not included in the income reported.

** Misc., includes single supplements, and replacements for pages of handbooks.

TABLE 3. ASMH CHAPTERS RECEIVED FROM PREVIOUS CONTRACTOR

Alloy	Chapter Type		Percent of Draft Completed	Percent of Final Copy Completed
	New	Revision		
IN 601	X		100	100
AF 1410 Steel	X		100	34
2014 Al	X		100	58
Inconel 617		X	100	84
Nimonic 105	X		100	0
Ti-6Al-4V	Addendum		100	0
IN-706	X		75	0
Incoloy 800 H	X		80	0
9-Ni Steel	X		20	0
HY-130 Steel		X	10	0
Ti-3Al-2.5V	X		5	0
CP Ti		X	2	0

TABLE 4. ADDITIONS TO AEROSPACE STRUCTURAL METALS HANDBOOK (ASMH) DURING 1979

	Handbook	Number of Pages (1)	Chapter Code	New, Revised	Supplement
IN 601	ASMH	26	4121	New	First Quarter
AF 1410 Steel	ASMH	30	1224	New	Second Quarter
Inconel 617	ASMH	15	4215	New	Second Quarter
Aluminum 2014	ASMH	30	3201	Revision	Third Quarter
Nimonic 105	ASMH	14	4204	Revision	Third Quarter
Inconel 706	ASMH	15	4110	New	Fourth Quarter (2)
Incoloy 800H	ASMH	23	1615	New	Fourth Quarter (2)
Title Page, Table of Contents	ASMH	21	–	–	Fourth Quarter (2)

(1) Number of pages for supplements includes index, title and instruction pages.

(2) Chapters compiled, should be mailed during February 1980.

TABLE 5. PUBLICATION PLAN FOR THE AEROSPACE STRUCTURAL METALS HANDBOOK (ASMH) IN 1980 AND 1981

Alloy	Type of Chapter New(N), Revision(R)	Scheduled Completion Date of Draft	Mailing Date	Remarks
Ti-6Al-4V	Addendum	–	Feb 15, 1980	In Technical Review
9-Ni Steel	N(Brown)	Jan 30, 1980 Revision	April 15, 1980	Author for Revision 11/8 (End of Jan 80)
HY-130 Steel	R(Brown)	Jan 30, 1980	April 15, 1980	Author for (Draft 1/80) Completion
Ti-3Al-2.5V	N(Shannon)	Feb 1, 1980	July 15, 1980	Author for Completion
2024Al	R(Kattus)*	Aug 15, 1980	Oct 15, 1980	Last Rev 3/63
316 Stainless Steel	R(Brown)*	Aug 15, 1980	Oct 15, 1980	Last Rev 3/74
Ti-10V-2Fe-3Al	N(Shannon)*	Nov 15, 1980	Jan 15, 1981	
Mar-M-246, 247	N(Manson)*	Nov 15, 1980	Jan 15, 1981	
Ti (Comm Pure)	R(Hickey)*	Jan 31, 1981	Apr 15, 1981	Last Rev 3/63
314 Stainless Steel	R(Kattus)*	Jan 31, 1981	Apr 15, 1981	Last Rev 3/63
Ti-5Al-2.5Sn	R(Shannon)*			Last Rev 3/65
Inconel 600	R(Kattus)*			Last Rev 3/67
Inconel 750	R (Kattus)*			Last Rev 3/66

* These chapters have been suggested by the author noted but subcontracts have not been issued.

A number of alloys have been suggested as subjects for future supplements. Some of these remain from the previous contract while others were suggestions by Battelle technical staff as shown in Table 6. The alloys listed will be evaluated and prioritized and the assignment of authors and authorization for chapter preparation will be started as funding permits.

Structural Alloys Handbook (SAH)

The SAH was designed and initiated by the previous contractor and was directed toward the perceived needs of the construction, machine tool, heavy equipment, automotive, and general manufacturing industries. The cost-effectiveness and the scope of this document with respect to the MPDC contractual scope are being reviewed and evaluated. In the meantime, during 1980, Battelle will continue to serve the 691 customers who are past purchasers of the SAH. The future supplements to the SAH will depend on the results of the evaluation and funding limitations for MPDC. In keeping with the past effort, two new supplements for the SAH were undertaken during this reporting period:

- Magnesium Selector Chart, 16 pages
- Type 301 Stainless Steel, 62 pages (to be mailed February, 1980).

The Magnesium Selector Chart was prepared by Dr. T. E. Leontis, a Battelle Staff member, who is a leading authority in the U.S. on magnesium. The stainless steel section was prepared by Mr. Daniel Maykuth who is assigned to the Materials Information Program Office.

The publication plans for the SAH for 1980 and 1981 are listed in Table 7. As shown, the Copper Alloys Selector Chart is scheduled as the first 1980 supplement. Candidate materials for future supplements are listed in Table 8.

In the past, MPDC queried the SAH users at least once each year to obtain their recommendations for candidate materials for supplements to the handbook. Battelle intends to continue this practice; the users' comments will be solicited with the second supplement for 1979.

Alloy Cross Index (ACI). The ACI is generated from a portion of the data in the Numeric Data Base. The first volumes printed by Battelle were somewhat similar to the previously issued publications; all orders on hand were filled in November, 1979. Extensive remodeling is still under consideration. The changes under consideration are:

- Make the text more readable
- Remodel the format to make the index easier to use
- Combine the two volumes into one
- Change binding system (the binding system was slightly modified in the recently issued ACI).

Also, the compatibility of the MCIC "International Alloy Handbook" series and the MPDC ACI will be thoroughly reviewed.

TABLE 6. CANDIDATE MATERIALS FOR THE FUTURE SUPPLEMENTS FOR THE AEROSPACE STRUCTURAL METALS HANDBOOK

Previously Selected	Selected Under the Present Contract	
	Aluminum Alloys	
	2036	7075
	2124	7475
	5182	A357 (Casting)
	7049	A201.1 (Casting)
	Titanium Alloys	
Ti-11	Ti-10 Mo-6 Cr-2.5 Al	
Ti-2.0 Cu	Ti-10 Mo-8V-2.5 Al	
Ti-10V-2 Fe-3 Al	Ti-15V-3 Cr-3Al-3 Sn	
Ti-2 Mo-8V-2 Fe-3 Al	Ti-6 Al-2 Sn-2 Fe-2 Cr-2 Mo-0.23 Si	
	Ti-5 Al-5 Sn-2 MO-0.24 Si	
	Ti-5 Al-5 Sn-2 Fe-4 Mo-0.25 Si	
	Ti-4.5 Al-5 Mo-1.5 Cr	
	Ti-2.5 Al-8 Mo-4.5 Cr	
	Nickel Base Alloys	
Nimonic 90	Hastelloy – S	
Nimonic 115	Incoloy – 903	Inconel 738
Rene 95	NASA – 11B-7	IN 939
MP 35 N	NASA – 11B-11	Hastelloy C – 276
IN 792		MA 754 (PM alloy)
	Ferrous Alloys	
4340 Steel		CTX-1
E9310 Steel		18 Ni Maraging Steel (250)
10 Ni Steel		Custom 450 PH Stainless Steel
314 Stainless Steel		
21-6-9 Stainless Steel		
CG-27 Steel		
MAR-M-246		
	Miscellaneous Alloys	
T-111 (Tantalum)		TZM (Molybdenum)
LOCKALLOY		
UDIMET 500		
C-355 (Cast)		
	Appendixes	
Low-Cycle Fatigue		

TABLE 7. PUBLICATION PLAN FOR THE STRUCTURAL ALLOYS HANDBOOK (SAH) IN 1980 AND 1981

Material Covered	Type of Publication	Scheduled Mailing Date	Author	Remarks
301 Stainless Steel	New Chapter	Feb 15, 1980	D. Maykuth MCIC Staff	Second Supplement for 1979 Drafted-in Reports
Copper Alloys	Selector Chart	June 15, 1980	D. Maykuth and Copper Development Association	First Supplement for 1980
HY 130 Steel	New Chapter	Dec 15, 1980	BCL Author	Second Supplement for 1980
5052 Aluminum	New Chapter	June 15, 1981		First Supplement for 1981
Wrought Titanium	Selector Chart	Dec 15, 1981	BCL Author	Second Supplement for 1981
Aluminum Alloys	New or Revised Chapter			Selected by Alum. Assoc.

TABLE 8. CANDIDATE MATERIALS FOR FUTURE SUPPLEMENTS TO THE STRUCTURAL ALLOYS HANDBOOK

Source*	Material	Source	Material
OC	HY 130/140 Steel	OC	70-30 Brass
OC	HY 180 Steel	OC	6A1-4V Titanium
OC	400, 405, 409 Stainless Steel	OC	5083, 5086 Aluminum
OC	17-7 PH Stainless Steel	OC	6063, 6364 Aluminum
OC	17-4 PH Stainless Steel		
OC	15-5 PH Stainless Steel	BCL	3003 Al
OC	Cast Magnesium	BCL	6009, 6010 Al

*OC – Candidates from the previous (old) contract.
BCL – Candidates suggested by technical staff at Battelle's Columbus Laboratories.

STATE-OF-THE-ART STUDIES

Our assessment of the MPDC files indicated that state-of-the-art studies not involving direct use of the numeric data bank could be handled by either MPDC or MCIC. With MPDC's limited resources and the data base conversion problems, no state-of-the-art studies were undertaken in 1979. This area will be reviewed again in early 1980.

CRITICAL REVIEWS AND TECHNOLOGY ASSESSMENTS

(Because of the similarity in scopes for MCIC and MPDC, the status of this task is the same as for "State-of-the-Art Studies" discussed in the previous section.)

INQUIRY SERVICES

Technical

During the first year of operation 42 technical inquiries were received, as shown in Appendix D. Two inquiries were paid, resulting in an income of $620.

It has been noted that, in addition to the inquiries intentionally referred to MCIC for handling, more inquiries concerning mechanical properties are coming in directly to MCIC. This may be a result of the technical community's familiarity with MCIC (a logical place to turn when informed of the transfer of the MPDC operation).

The total expenditure for the handling of 42 technical inquiries was $1,524. This sum included $400 for Inquiry Cost estimating.

The majority of the inquiries was for mechanical properties for specific alloys. Many of these could be handled over the telephone through the use of reference material such as the ASMH. In several instances, the MCIC files were used to provide the technical information sought.

The marketing of this service to increase visibility and use by the technical community will be examined after the data base is on-line and a charge system has been developed.

Nontechnical

Almost all of the nontechnical inquiries which were received were questions about publications and the change of contractors.

Bibliographic

No bibliographic inquiries were received during this reporting period.

CURRENT AWARENESS, MARKETING, AND PROMOTION

Current Awareness

The MPDC current awareness program did not meet the rather ambitious goals set at the beginning of the contract due to the problems encountered in the data base conversion and the resultant funding and time constraints.

The MPDC current awareness program was planned to consist primarily of a MPDC bimonthly Newsletter and a User Guide. Both were planned to be issued free. The Newsletter and User Guide are both in the planning stage and will be issued when time and resources are available.

The Newsletter will contain announcements of significant additions to the data base, availability of new products, and services. The previous publication, "Inventory Report", will not be continued because the information contained therein, primarily the summary of the MPDC data holdings, will be published annually in the Newsletter.

The "User Guide" issued by the previous contractor will be modified to reflect any changes in operating procedures and assist the user in obtaining output from the center in the most expeditious and cost-effective manner. The "User Guide" is planned to be an annual sent to a list of over 15,000 people who are interested in materials.

Promotion and Marketing

The MPDC Promotion and Marketing program along with the Current Awareness program, is vital to the well being of the center. Experience with many information centers at Battelle has shown that an important function of any center is to make people aware of the availability of the products and services of the center. Only when this vital function has occurred can the government realize the tremendous savings possible through proper use of data and information available through a full-service Information Analysis Center.

The MPDC promotion and marketing program for 1979 was conducted within the funding restraints imposed by the change in contractors.

The marketing and promotion program was formulated to promote the use of the Center through announcement of the availability of our products and services by direct mail. Initial announcements noted the change of contractor and the new point of contact at Battelle.

On February 7, 1979, a flyer announcing the change of location for MPDC was inserted in the MCIC *Current Awareness Bulletin* (CAB) which is normally distributed to approximately 5,000 in the material's community. On March 9, 1979, a one-page letter was sent to all handbook owners of record (1648 names) to inform them of the new MPDC location. In addition, the new and available services were mentioned along with the new prices for MPDC documents. As an added promotion, 100 copies of the MPDC brochure and price list were sent to Washington, D.C., for distribution at the International Materials Congress (organized by the National Materials Advisory Board), which was held during the week of March 26-29, 1979.

After the data base in on-line and available to users, the new services of MPDC and new location at Battelle will be announced to over 15,000 materials oriented people on an AMMRC mailing list, in addition to the 5000 people on the MCIC CAB mailing list and 1648 purchasers of the MPDC handbooks.

Over 4000 of the old brochures describing MPDC were received from the former contractor. These have been modified by applying an appropriate decal and are being used during the interim period while a new promotional brochure is designed and prepared. In July, a 4-page Status Report for MPDC was prepared. This has been used as a letter attachment in response to inquiries.

A listing of MPDC publications was included with an announcement of changes in price for MCIC documents. This announcement was mailed to the MCIC CAB list (5000 entries), MPDC document holders list (1650 entries), the AMMRC mailing list (about 17,000 entries), and to the MCIC purchasers list (about 2800). Also, the MPDC documents and prices are included on the list of MCIC publications which is included with all publications sold by MCIC.

The MPDC marketing and promotion program will continue as established during the past year. Insert flyers will be included in the MCIC Current Awareness Bulletin (CAB) along with at least one promotional mailing to the MPDC purchasers list.

Several special areas are scheduled for expansion.

One of the special areas in which promotions will be conducted is military libraries and other government libraries as mailing lists can be developed or identified. MPDC products and services will be brought to the attention of government librarians along with the opportunity and instructions for MIPR or transfer of funds from Military or Government Agencies to MPDC to avail themselves of these.

Other special mailing will include promotion of MPDC products and services to an MIT Press purchasers mailing list and a possible mailing to the Army Materials and Mechanics Research Center (AMMRC) list.

A users guide and newsletter will also be developed within funding limitations for the coming year.

Negotiations are currently under way with a commercial publisher to handle the marketing and sale of the ASMH and SAH. In return for the sale of books at discount to the publisher, the company would undertake a major marketing campaign which would reach approximately 500,000 personnel engaged in materials and materials-related efforts. If an agreement is negotiated, we anticipate a surge in the sale of the ASMH and SAH.

Meetings Attended

During 1979, the following travel by Harold Mindlin, MPDC Manager, was related to the operation of the Center:

Dates	Destination	Purpose
10 Jan	AMMRC (S. Valencia) Boston	Project discussions
11 Jan	DLA (J. Blue, J. Smarsh) Washington	Project discussions
30 Jan	Ford Motor Co., Detroit	Promote use of MPDC and determine industry attitude toward MPDC
31 Jan	Bethlehem Steel Co. Bethlehem, PA	Promote use of MPDC and determine industry attitude toward MPDC
15 Feb	Aluminum Association Washington, DC	Discuss ASMH, SAH Aluminum Chapters
24 Apr	ASM, Cleveland	Discuss Mechanical Properties Data Base
21-25 May	ASTM Annual Meeting San Francisco	Attend meeting and discussions of on-line data bases
2-3 July	National Research Council Washington	Presentation on MPDC operations
27 July	DLA, Washington	Project discussions
7 Aug	Metal Properties Council Pittsburgh	Numeric data bases
11 Sep	NASA-Langley	Use of numeric data bases
17 Dec	DLA/DTIC, Washington	IAC Manager's Meeting

It should be noted that although all of the above trips had some content related to MPDC, all travel expenses were not accrued to MPDC.

Visitors

The following visitors were at MPDC during 1979 to observe and discuss various operations, products and/or services of the Center:

Persons(s)	Company/Country	Date
Masateru Suwa	Hitachi/Japan	
(Group)	Cummins Engine	
W. Black	Copper Development Assoc.	
W. Brown, J. Shannan	NASA Lewis	
S. Valencia, COTR	AMMRC	16 Feb
M. Froland	General Electric	6 Apr
Y. Yamamoto	Neutrino/Japan	12 Jun
J. Bognanoff	Purdue Univ.	18 July
C. Kobrin	Cordura Publishing	28 Aug
C. Holister	General Electric	12 Sep
J. Guilleminet A. Yanez	CEDOCAR, France	10 Dec

INCOME AND COST RECOVERY

In compliance with current DoD policy, charges for information services have been made when appropriate. The objective of the service-charge program is the achievement of income for products and services equal to at least 50 percent of the initial contract funding. The income is intended to offset some costs related to operations, products, and services in order to expand total services to the technical community.

The income achieved by MPDC in the fourth quarter was $9,847.93. The total annual income was $72,120.51 from the sales of products (See Table 2) and services. This total income for the annual period represents 36 percent of the basic funding ($210,000). Considering the extended effort which is being expended to convert the data base ($124,603 through December), we believe that the income obtained in the first year of operation is greater than one might have expected.

The contract Status Reports are presented in Appendix E.

Mailings

Use of the mailing indicia is not authorized under this current contract, hence, postal charges were made directly to the project. Table 9 presents summaries of the items mailed during the fourth quarter and for the first year of operation. The total expenditures were:

Fourth Quarter $ 431.34

Annual $2,400.95.

FUTURE PLANNING

After completion of one year of operation, it is quite evident that much remains to be accomplished in order to achieve the objectives of the Center. Although the data base conversion is now proceeding with a minimum of difficulty, several areas still need attention.

- Completion of the conversion of the MPDC data base to the Battelle system. (See Figure 1 for current schedule.)
- Evaluation of the data currently in the system with respect to accuracy, timeliness, completeness.
- Input of new data from current reports and documents.
- Creation of output reports and profiles to assist users in accessing and retrieving information from the data base.
- Assembly of a User Guide and thesaurus for potential data base users.

Ongoing tasks—such as the review of reports and documents of potential interest and containing data—will be addressed as time and funding permit. The maintenance of the Handbooks will be continued in accordance with the proposed schedule presented earlier in this report. The status and future of the *Structural Alloys Handbook* will be reviewed. A major expense will be incurred in 1980 to cover the reprinting and replenishing of Handbook stocks.

The *Alloy Cross Index* will be reformatted and printed. The addition of new material, currently available from MCIC, will be considered.

The Promotion and Marketing program will be addressed early in 1980 to ensure maximum visibility for the Center. This must be done to meet the cost recovery goals of the contract.

TABLE 9. FOURTH QUARTER AND ANNUAL SUMMARY OF POSTAL CHARGES

Item	1st Class/ Airmail	3rd Class	4th Class Book Rate	Air Printed Matter
		a. Fourth Quarter Summary		
Handbooks, Boxes			55(1)	
Supplements, Flats		264		29
Letter Size – Announcements, Invoices and Misc.	81/6			
		b. Annual Summary		
Handbooks, Boxes			121(1)	
Supplements, Flats		1425	2	140
Handbooks, Mail Sacks			22(2)	
Letter Size – Announcements, Invoices and Misc.	2559/6			

(1) Includes 2 boxes sent UPS and 1 Federal Express.

(2) Overseas shipments.

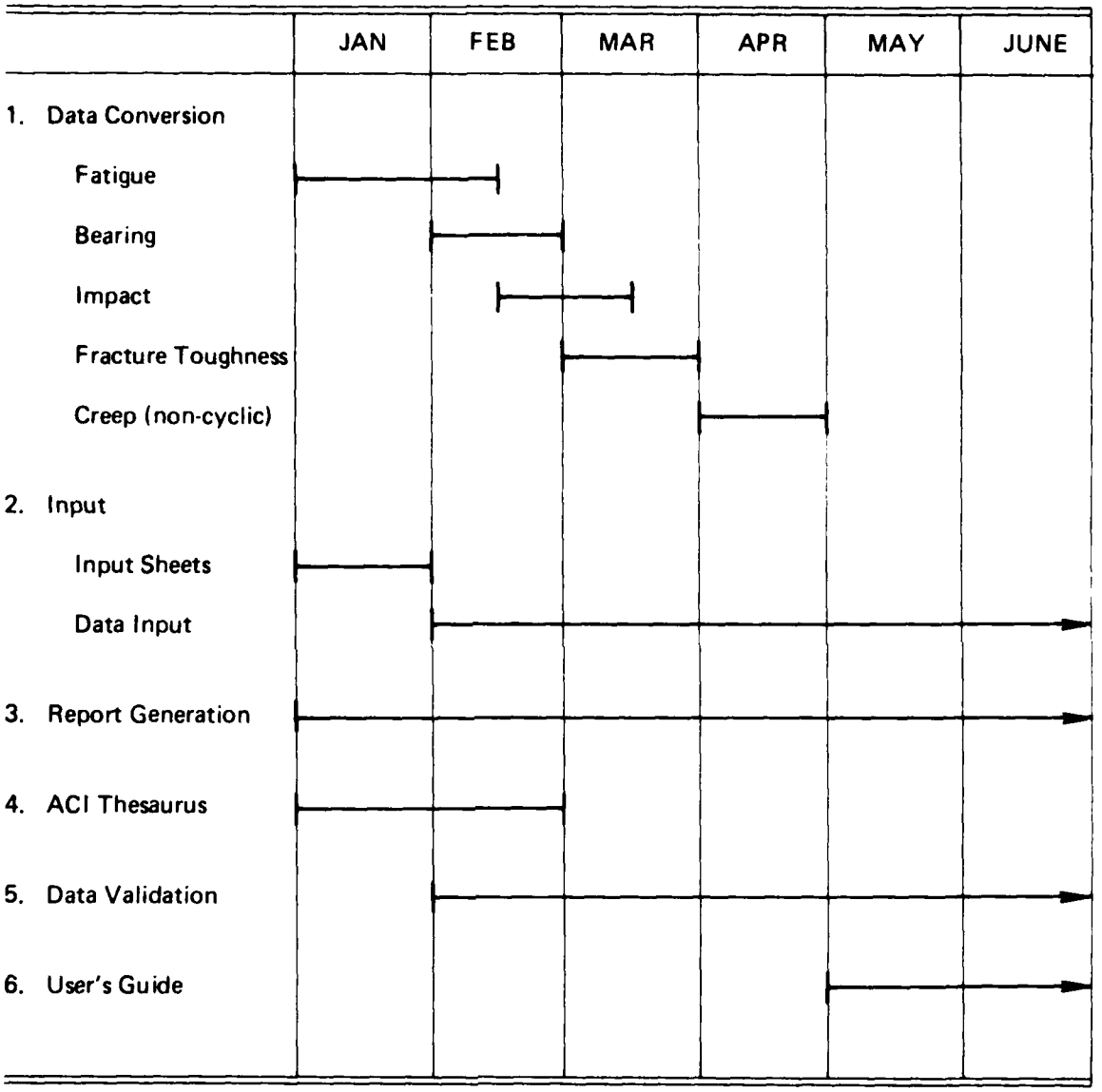

FIGURE 1. SCHEDULE FOR COMPLETION OF THE CONVERSION OF THE ONLINE NUMERIC DATA BASE

APPENDIX A

PERSON-HOUR EXPENDITURES FOR DATA BASE OPERATIONS

TABLE A-1. INFORMATION SYSTEM SECTION PERSON-HOUR EXPENDITURES FOR DATA BASE OPERATIONS JANUARY 1 – DECEMBER 31, 1979

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Subtask Total	Task Total
Numeric Data Base	1. Data Analysis/Reformat														684
	a. System Analysis	115	71	22					8		8	9		233	
	b. Programming (Data Reformat)			115	170.5	30.5	8	15	--	6	16	29	10	400	
	c. Data Verification						40	11						51	
	2. BASIS Conversion														1477
	a. System Design			70	11	3	6	2	43		2	1	30	168	
	b. Programming (Conversion)				46	94	72	76	24	21	50	70	100	553	
	c. Data Validation					40	25		3		32	10	20	130	
	d. Updates (Test System)					10	16	75	116	74	38	54	55	438	
	e. Programming (Reports)					15	6	48		35	22	22	40	188	
General Support	3. Input Sheets	10	7			9				3	10				39
	4. SAH/ASMH	15	20			2	6	76	27	3	44	20			213
	5. MCIC Duplication Checking	70	95	84	76	113	123	44	31	32	63	71	23		825
	6. Management	29.5	5.5	15	16	9	7	30	11	20	19	6	33		201
		239.5	198.5	306	319.5	325.5	309	377	263	194	304	292	311		3439

APPENDIX B

MPDC DATA BASE FOR TENSILE PROPERTIES

APPENDIX B

MPDC DATA BASE FOR TENSILE PROPERTIES

The MPDC data base is now established with 238,000 data records containing over 400,000 data points on the tensile properties of metals and metal alloys. Figure B-1 is a sample of the data as contained in the system. A description of the terms used in the record is as follows:

ACCESSION NUMBER:	Internal document number
POINTER:	Internal document number for the record that contains MPDC bibliographic data
NAME:	Alloy Cross Index reference number
FORM:	Specimen Form
ELEMENT (wt %):	Element: weight percent
PRIMARY OPERATION:	Primary operation for as-received material
HT, TYPE:	Type of heat treatment for specimen
SECONDARY OPN:	Secondary operation on specimen
STR CONC FAC(T):	Stress concentration factor
SPEC THICK (DIA):	Specimen thickness or diameter
GAGE LENGTH:	Specimen gage length
TEST TYPE:	Type of test for specimen
SPEC ORIENT:	Specimen orientation for test
TEST RATE:	Rate applied during test on specimen
TEST TEMP:	Test temperature
ULT STRENGTH:	Ultimate strength for test type. (Multiple values are given – each separated by a semicolon. This example (Figure 1) indicates that three specimens were tested under the same conditions – as given above.)
YLD STRESS, % OFF:	Yield stress – percent offset (for the three specimens given above)
MOD OF ELAST:	Modulus of elasticity (for the three specimens given above)
ELONGATION (%):	Percent elongation (for the three specimens given above)

Figure B-2 is a sample of the searchable terms in the data base (the document index terms). The terms are composed of a prefix that identifies the type of data that is contained in the term, a semicolon and then the term on which the document was indexed. A summary of the terms is as follows:

FM:	The form in which the material was received
PMY:	The primary operation performed on the as-received material before it was received
HT:	The heat treatment performed on the specimen

It should be noted that there are many inconsistencies and errors in the terms as they were transcribed from the data tapes. These will be corrected before the data base is brought online for general use.

Figure B-3 contains a sample of the statistical analysis capability available to analyze the data contained in the data base. Initially, this package will provide simple statistics (mean and standard deviation), linear regression and analyses of populations (F and t tests) for tension data. During the next two quarters, this will be enhanced to include other analysis routines and other types of tests. Eventually, the statistical system will include an interface to the SPSS statistical routines which will enable the user to generate more elaborate analysis for the data.

To use the analysis routine shown in Figure B-3, the user defines a set by searching the data base (ID:8 – 1500 ITEMS SAVED AS SET 1 is the SET used in Figure 3). The user initiates the analysis routine by entering 'RUN MPANAL' and then defines the type test and the type analysis to be conducted. In the example, simple statistics were chosen for tension test data. The user then defined the subpopulations within the set to analyze (FORM equals "sheet" and TTEMP is the test temperature between 60-80 F and for other data set FORM equals "tube" and test temperature between 60-80 F), identified the dependent variables to compute (US-Ultimate Strength, YS-Yield Strength, ELONG-Percent Elongation and AREA-Reduction in Area), and transformed the ELONG and AREA variables to Natural Logs.

```
ITEM 1

  0. ACCESSION NO.     :172754
 15. POINTER           :2400
 21. NAME              :8004
 23. FORM              :SHEET
 24. ELEMENT(WT%)      ;TI:71.2 ;V:13.600 ;CR:11.200 ;AL:3.500 ;
                            FE:0.250 ; O:0.120 ;C:0.020 ;N:0.020 ;
 32. PRIMARY OPN       :HOT ROLLED - SHEET, PLATE, BARS, RI NGS
 35. HT, TYPE          :SOLUTION TREATMENT, QUENCHED - 33 DE G. F OR
                            ABOVE
 47. SECONDARY OPN     :SHEARED -OR- BLANKED - HAND OR POWER SHEARS,
                            NIBBLED , MILLED SHAPED, PLANED -OR-
                            MACHINED
 54. STR CONC FAC(T)  :1.0
 56. SPEC THICK (DIA):0.063 INS
 57. GAGE LENGTH      :2 INS
 67. TEST TYPE        :TENSION
 70. SPEC ORIENT      :LONGITUDINAL - THE GRAIN DIRECTION IS PARALLEL
                            TO THE LENGTHWISE AXIS OF THE SPECIMEN.
 71. TEST RATE        :0.005 -INCHES/INCH/MINUTE & INCREASED TO
                            FAILURE AFTER A SPECIFIED LOAD
 73. TEST TEMP        :400.0 - TEMP. IN DEG. F
 78. ULT STRENGTH,KSI:116.000;116.000;117.000;
 79. YLD STRESS,% OFF:107.000 - 0.2%; 108.000 - 0.2%; 108.000 - 0.2%;
 82. MOD OF ELAST     :13.400 ;12.800 ;13.000 ;
 83. ELONGATION, %    :22.00;22.00;22.00;
```

FIGURE B-1. SAMPLE MPDC DATA BASE DOCUMENT

	.ITEMS.	TERMS
A	5	FM:BAR
B	12	FM:PLATE
C	5	FM:ROUND
D	542	FM:SHEET
E	582	FM:SPECIAL SHAPE
F	335	FM:TUBE

	.ITEMS.	TERMS
A	255	PMY:BARS
B	20	PMY:COLD HEADING
C	2	PMY:COLD ROLLED
D	41	PMY:FORGED
E	541	PMY:FORGED CLOSED DIE
F	20	PMY:FORGED OPEN FRAME
G	20	PMY:HAMMER
H	253	PMY:HOT ROLLED
I	255	PMY:PLATE
J	2	PMY:R INGS
K	253	PMY:RI NGS
L	205	PMY:ROLLED
M	255	PMY:SHEET
N	20	PMY:SWAGING
O	20	PMY:UPSETTING

	.ITEMS.	TERMS
A	72	HT:AGED
B	2	HT:APPLIED A FTER SOLUTION TREATMENT
C	5	HT:AS CAST CONDITION
D	5	HT:AS FABRICATED
E	146	HT:AS LAST OPERATION
F	13	HT:C OLD WORK
G	2	HT:C OLD WORKED
H	548	HT:COOL OR QUENCH TO ROOM TEMP
I	15	HT:DOUBLE OR MORE AGE
J	930	HT:DRAW
K	8	HT:HEAT
L	1	HT:NORMALIZED
M	207	HT:OR
N	8	HT:PRE
O	146	HT:PRIOR TO TEMPER
P	10	HT:PRIOR TO TEMPER OR AS LA
Q	7	HT:PRIOR TO TEMPER OR AS LAST OPERATION
R	218	HT:QUENCHED
S	915	HT:SINGLE AGE
T	766	HT:SOLUTION TREATMENT
U	41	HT:ST RESS REL
V	146	HT:ST RESS RELIEVE
W	2	HT:STRAIN
X	17	HT:STRESS RELIEVE
Y	930	HT:TEMPER
Z	218	HT:33 DE G

FIGURE B-2. SAMPLE MPDC DATA BASE INDEX TERMS

```
   4/ ID:8
      1500 ITEMS SAVED AS SET 4
   5/ RUN MPANAL


MPDC ANALYSIS MODULE

THIS MODULE IS USED TO REFINE SELECTION OF DATA
RECORDS, SELECT AND ANALYZE DATA AND PRODUCE
REPORTS, TABULATIONS OF RAW DATA AND REFERENCES.

DO YOU WANT THESE REPORTS TO BE PRINTED OFF-LINE
AND THEN MAILED TO YOU? (YES/NO)
     / NO

SELECT ONE TYPE OF TEST DATA BY NUMBER:
  1. (RETURN TO BASIS SEARCH)
  2. TENSION
    / 2

SELECT ONE TYPE OF ANALYSIS BY NUMBER:
  1. SAMPLE STATISTICS
  2. LINEAR REGRESSION
  3. F AND T TESTS
    / 1

DO YOU WANT A TABULATION OF RAW DATA USED IN THIS
REPORT (INCLUDES DESCRIPTIVE HEADER)? (YES/NO)
     / NO

DEFINE ONE OR MORE SUBPOPULATIONS (UP TO 10).
EACH SUBPOPULATION IS A SEPARATE CASE.

DEFINE SUBPOPULATION  1
NAME                  1
     / ALL
FORM                  1
     / SHEET
PMYOPN                1
     / ALL
THICK                 2
     / ALL
HTYPE                 1
     / ALL
ORIENT                1
     / ALL
TRATE                 1
     / ALL
TENV                  1
     / ALL
TTEMP                 2
     / 60,80
```

FIGURE B-3. SAMPLE STATISTICS

```
DO YOU WANT TO DEFINE ANOTHER SUBPOPULATION? (YES'NO)
     ' YES

DEFINE SUBPOPULATION  2
NAME                  1
     ' ALL
FORM                  1
     ' TUBE
PMYOPN                1
     ' ALL
THICK                 2
     ' ALL
HTYPE                 1
     ' ALL
ORIENT                1
     ' ALL
TRATE                 1
     ' ALL
TENV                  1
     ' ALL
TTEMP                 2
     ' 60'80

DO YOU WANT TO DEFINE ANOTHER SUBPOPULATION? (YES'NO)
     ' NO

SELECT ONE OR MORE (UP TO 5) DEPENDENT VARIABLES BY
NUMBER.  EACH WILL BE TREATED SEPARATELY.
  1. US
  2. YS
  3. PLMT
  4. MELAS
  5. ELONG
  6. AREA
  7. POISSON
  8. TENLD
     ' 1,2,5,6

THE VARIABLES THAT YOU HAVE SELECTED MAY BE TRANSFORMED
PRIOR TO USE IN THE ANALYSIS.  PRESENTLY IMPLEMENTED
TRANSFORMATIONS ARE LOGARITHMS AND RECIPROCALS.  DO YOU
WISH TO TRANSFORM ANY OF YOUR VARIABLES? (YES'NO)
     ' YES

AS EACH VARIABLE IS LISTED, INDICATE BY NUMBER THE TYPE
OF TRANSFORMATION DESIRED.  OPTIONS ARE:
  1. NO TRANSFORMATION
  2. LOG BASE 10
  3. NATURAL LOG
  4. RECIPROCAL
US
     ' 1
YS
     ' 1
ELONG
     ' 3
AREA
     ' 3
```

FIGURE B-3. SAMPLE STATISTICS (Continued)

```
SAMPLE STATISTICS FOR SUBPOPULATION 1

SELECTION CRITERIA FOR THIS SUBPOPULATION WERE:
  VARIABLE MNEMONIC   VALUE OR MIN/MAX

  FORM                SHEET
  TTEMP                 60.00  /  80.00

VARIABLE MNEMONIC   UNITS OR TRANSFORM  NR OBS     MEAN   STD DEV

  US                                       598    165.88   32.0898
  YS                                       497    160.58   29.1842
  ELONG             NATURAL LOG            527      1.64    0.8795
  AREA              NATURAL LOG              4      1.97    0.5164


SAMPLE STATISTICS FOR SUBPOPULATION 2

SELECTION CRITERIA FOR THIS SUBPOPULATION WERE:
  VARIABLE MNEMONIC   VALUE OR MIN/MAX

  FORM                TUBE
  TTEMP                 60.00  /  80.00

VARIABLE MNEMONIC   UNITS OR TRANSFORM  NR OBS     MEAN   STD DEV

  US                                       581    189.28   27.2026
  YS                                       442    188.44   18.2001
  ELONG             NATURAL LOG            451      1.72    0.5230
  AREA              NATURAL LOG             10      4.00    0.0844

SELECT ONE TYPE OF TEST DATA BY NUMBER:
  1. (RETURN TO BASIC SEARCH)
  2. TENSION
    / 1

DO YOU WANT COMPLETE REFERENCES TO BE APPENDED
TO THESE REPORTS? (YES/NO)
    / NO


LIST OF ACCESSION NUMBERS CONTAINING REFERENCE DATA

ACCESSION NUMBER 2400
ACCESSION NUMBER 2914
ACCESSION NUMBER 2564
ACCESSION NUMBER 2565
ACCESSION NUMBER 2946
ACCESSION NUMBER 2808
ACCESSION NUMBER 2642
ACCESSION NUMBER 25
ACCESSION NUMBER 2351
ACCESSION NUMBER 2384
ACCESSION NUMBER 2364
ACCESSION NUMBER 3100
ACCESSION NUMBER 2676
ACCESSION NUMBER 3067
ACCESSION NUMBER 2767
```

FIGURE B-3. SAMPLE STATISTICS (Continued)

This system responded by displaying the selection criteria, variables, units or transformations, number of observations, mean and standard deviation. At the end of the analyses, the system listed the MPDC identification numbers from which the data were taken.

APPENDIX C

ITEMS RECEIVED FROM FORMER MPDC CONTRACTOR

APPENDIX C

LIST OF ITEMS RECEIVED FROM FORMER MPDC CONTRACTOR

MECHANICAL PROPERTIES DATA CENTER
TRAVERSE CITY, MICHIGAN 49684

PACKING LIST - Page 1

STRUCTURAL ALLOYS HANDBOOK

	ITEM	No. Cases	Qty/Case
1.	SAH, Binders, Vol. #1	1	25
	SAH, Binders, Vol. #1	1	18
	SAH, Binders, Vol. #2	7	26
	SAH, Binders, Vol. #2	1	21
2.	SAH, Handbook Body	7	12
	SAH, Handbook Body	1	8
	SAH, Handbook Body	1	4
3.	SAH, Supplement, 1974 - 1st half	4	38
	SAH, Supplement, 1974 - 2nd half	3	44
	SAH, Supplement, 1975 - 1st half	3	75
	SAH, Supplement, 1975 - 2nd half	6	34
	SAH, Supplement, 1976 - 1st half	5	70
	SAH, Supplement, 1976 - 2nd half	3	85
	SAH, Supplement, 1977 - 1st half	12	48
	SAH, Supplement, 1977 - 2nd half	9	28
	SAH, Supplement, 1978 - 1st half	1	330
	SAH, Supplement, Misc. Assort.	1	-
4.	SAH, Complete Supplement, 1974	4	24
	SAH, Complete Supplement, 1975	3	24
	SAH, Complete Supplement, 1975	1	21
	SAH, Complete Supplement, 1976	2	62
	SAH, Complete Supplement, 1976	1	33
	SAH, Complete Supplement, 1977	1	14
5.	SAH, Dividers	1	75

MECHANICAL PROPERTIES DATA CENTER
TRAVERSE CITY, MICHIGAN 49684

PACKING LIST - Page 2

	ITEM	No. Cases	Qty/Case
1.	ASMH, Binders, Vol. #1	6	28
	ASMH, Binders, Vol. #1	1	20
	ASMH, Binders, Vol. #2	7	28
	ASMH, Binders, Vol. #2	1	21
	ASMH, Binders, Vol. #3	7	28
	ASMH, Binders, Vol. #3	1	15
	ASMH, Binders, Vol. #4	7	28
	ASMH, Binders, Vol. #4	1	26
	ASMH, Binders, Vol. #5	8	20
2.	ASMH, Bodies, Vol. #1	26	14
	ASMH, Bodies, Vol. #1	1/2	10
	ASMH, Bodies, Vol. #2	30	12
	ASMH, Bodies, Vol. #2	1/2	8
	ASMH, Bodies, Vol. #3	26	14
	ASMH, Bodies, Vol. #3	1	10
	ASMH, Bodies, Vol. #4	44	8
	ASMH, Bodies, Vol. #4	1	10
	ASMH, Bodies, Vol. #5	29	12
	ASMH, Bodies, Vol. #5	1	14
3.	ASMH, Complete Supplements, 1974	1	20
	ASMH, Complete Supplements, 1975	1	10
	ASMH, Complete Supplements, 1976	3	30
	ASMH, Complete Supplements, 1977	3	60
4.	ASMH, 1st Qtr. 1978 Supplement	2	115
	ASMH, 2nd Qtr. 1978 Supplement	6	65
	ASMH, 3rd Qtr. 1978 Supplement	1	260
	ASMH, 3rd Qtr. 1979 Supplement	1	71
	ASMH, 4th Qtr. 1978 Supplement	1	68
5.	ASMH, Dividers	5	300 sets

MECHANICAL PROPERTIES DATA CENTER
TRAVERSE CITY, MICHIGAN 49684

PACKING LIST - Page 3

Misc. Items

	ITEM	No. Cases	
1.	Yearly historic record of ASMH	1	
	Yearly historic record of SAH	1	
2.	MPDC general Info. brochure	4	
3.	Encoding forms	2	
4.	Code books and masters	1	
5.	Reference library	14	
6.	Encoded forms	28	
7.	Alloy - Document card file	3	
8.	Code book changes and modifications	1	
9.	Data cards	168	
10.	Library, indexed documents	161	
11.	Inventory reports	1	
12.	Federal specifications	1	
13.	Encoders report sheets	2	
14.	Micro fiche, library reports	1	
15.	Author card file	1	
16.	Unindexed documents non & intermetallics	8	
17.	Title card file	2	
18.	Source card file	2	
19.	Camera ready art work of present chapters - SAH	1	CRATES
20.	Camera ready art work of present chapters - ASMH	2	"

MISC. SHIPMENTS RECEIVED DURING PERIOD
1/1/79 - 3/31/79

SAH Invoices	1
ASMH Invoices	1
SAH Supplement, 1978 2nd half	1
MISC. PHOTOS FOR BROCHURES/PROMOTIONAL USE COMPUTER TAPES AND INSTRUCTIONS PARTIALLY COMPLETED SUPPLEMENTS TO ASMH & SAH	1

APPENDIX D

SUMMARY OF MPDC TECHNICAL INQUIRIES

APPENDIX D. SUMMARY OF MPDC TECHNICAL INQUIRIES

Number	Date Received 1979	Inquirer	Date of Response	Charge
1	Jan. 9	Dr. R. Walson Cummins Engine	Jan. 9	No
2	Jan. 9	Joseph Wong Xerox Corp.	Jan. 15	No
3	Jan. 15	Don Meyers Piasecki Aircraft	Jan. 23	No
4	Jan. 23	Joseph Wong Xerox Corp.	Jan. 23	No
5	Jan. 23	J. Gossett Fisher Controls	Jan. 24	No
6	Jan. 24	S. Bhadia Diamond Power	Jan. 24	No
7	Feb. 7	Merle Wilson MOOG	Feb. 7	No
8	Feb. 12	R. Baldridge Dimac Manufacturing	Feb. 13	No
9	Feb. 13	L. Look LOM Corp.	Feb. 13	No
10	Feb. 20	J. O. Powell Northrop Corp.	Feb. 21	No
11	Feb. 20	P. Winslow Hughes Aircraft	Mar. 9	Yes
12	Feb. 22	W. Skewis Telecom Systems	Mar. 1	No
13	Feb. 26	J. Peterson G. E. Schenectady	Mar. 1	No
14	Mar. 15	J. Ryan Raytheon Co.	Mar. 15	No
—	Mar. 21	G. Fuller Battelle	Mar. 21	No

Number	Date Received 1979	Inquirer	Date of Response	Charge
15	Apr. 5	Paul Winslow Hughes Aircraft	Apr. 5	No
16	Apr. 2	W. Hoagland AVCO Lycoming	Apr. 6, 9	No
17	May 2	W. Heese Hydropower Corp.	May 2	No
18	May 29	Emil Troc Curtis Wright	May 29	No
19	June 12	Y. Yamamoto Neutrino (Japan)		Yes
20	June 29	M. Cukovic Goodyear Aerospace	June 29	No
21	July 3	J. Sohre Brown-Boveri	July 25	No
–	July 20	J. Hadden Battelle	July 20	No
22	July 23	T. Serandos Union Carbide	July 24	No
23	June 28	B. Brust BCL	July 7	No
24	Aug. 15	J. Faller Aberdeen Prov. Grounds	Aug. 17	No
–	Aug. 27	P. L. Gehlen Battelle	Aug. 27	No
25	Aug. 27	V. Zollar Babcock & Wilcox	Aug. 27	No
–	Aug. 28	R. Alfrey Materials Sciences Corp.	Aug. 28	No
26	Aug. 31	J. Trati Teledyne	Sep. 5	No

Number	Date Received 1979	Inquirer	Date of Response	Charge
27	Sep. 7	M. Seaman Oregon Grad. Ctr.	Sep. 7	No
–	Sep. 19	C. Vongoerlite Lear Siegler	Sep. 19	No
–	Oct. 8	J. Wysocki (?) Hughes Research	Oct. 8	No
–	Oct. 9	J. Varga Battelle	Oct. 9	No
28	Oct. 19	R. Zielinski Valeron Corp.	Oct. 28	No
29	Sep. 26	C. L. Robinson Chrysler Corp.	Oct. 30	No
30	Nov. 13	M. Valentine NAVAIR	Nov. 13	No
31	Nov. 16	I. Zuk Interdevelop- ment, Inc.	Nov. 26	No
32	Nov. 2[illegible]	R. Barry Cincinnati, Inc.	Nov. 21	No
33	Nov. 21	R. Lundquist Canada	Nov. 21	No
34	Nov. 28	L. Tichy Union Carbide	Nov. 29	No
35	Dec. 14	T. Thompson Nuclear Assurance	Dec. 14	No

APPENDIX E

FOURTH QUARTER AND ANNUAL CONTRACT STATUS REPORTS

APPENDIX E

FOURTH QUARTER AND ANNUAL CONTRACT STATUS REPORTS

(a) According to Battelle job classifications

(b) Cost of staff time directly related to MPDC operations

(c) Costs other than direct staff time

(d) Combined MCIC/MPDC documents

(e) Tagged for review for possible numeridc data base input

(f) ASMH – 3 sections of 15, 23, and 31 pages each
SAH – 1 section of 16 pages

(g) ASMH – 6 sections of 26, 30, 15, 15, 23 and 21 pages each
SAH – 1 section of 16 pages

(h) ASMH – 2 sections of 30 and 14 pages each

(i) Travel expenses for all meetings not accrued to MPDC.

TABLE E-1. QUARTERLY STATISTICS

INFORMATION ANALYSIS CENTER CONTRACT STATUS REPORT	NAME OF INFORMATION ANALYSIS CENTER: Mechanical Properties Data Center				QUARTER ENDING: December 1979		CUMULATIVE THRU	
AREA TITLE	OUTPUT UNITS PRODUCED	MANHOURS EXPENDED (a)			COSTS INCURRED			INCOME
		PROFESSIONAL	NON PROFESSIONAL	TOTAL	DIRECT (b)	INDIRECT (c)	TOTAL	
1. ACQUISITION AND INPUT OF SOURCE INFORMATION		61	197	258	2,392	2,863	5,255	
a. DOCUMENTS ACQUIRED	1,151 (d)							
b. DOCUMENTS REVIEWED	1,151							
c. DOCUMENTS CATALOGED	137 (e)							
2. TECHNICAL INQUIRY RESPONSES PROVIDED	10	8	5	13	217	- 132	85	–
3. BIBLIOGRAPHIC INQUIRY RESPONSES PROVIDED	–	–	–	–	–	–	–	–
4. HANDBOOKS/DATA BOOKS COMPLETED		131	1,052	1,183	6,161	22,618	28,779	9,847.93
a. NEW CHAPTERS/PAGES COMPLETED (f)	4/75							
b. REVISED CHAPTERS/PAGES COMPLETED	–							
c. DATA SETS COMPILED	–							
5. STATE-OF-THE-ART STUDIES COMPLETED	–	–	–	–	–	–	–	–
6. CRITICAL REVIEWS AND/OR TECHNOLOGY ASSESSMENTS COMPLETED	–	–	–	–	–	–	–	–
7. CURRENT AWARENESS AND PROMOTION EFFORTS		–	76	76	618	767	1,385	–
a. NUMBER NEWSLETTERS AND OR ANNOUNCEMENTS PUBLISHED	–							
b. NUMBER MEETINGS CONFERENCES ETC SUPPORTED	1							
8. OTHER Start-up	–	577	60	637	7,384	9,901	17,285	–
9. MANAGEMENT AND SUPPORT		88	36	124	2,596	3,404	6,000	
10 UNASSIGNABLE INDIRECT COSTS (Contractual Fee)		–	–	–	–	3,915	3,915	
11 TOTAL		865	1,426	2,291	19,368	43,336	62,704	9,847.93

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EDITION OF JUN 72 IS OBSOLETE

TABLE E-2. CUMULATIVE STATISTICS

INFORMATION ANALYSIS CENTER CONTRACT STATUS REPORT	NAME OF INFORMATION ANALYSIS CENTER: Mechanical Properties Data Center				QUARTER ENDING		CUMULATIVE THRU: December 1979	
AREA TITLE	OUTPUT UNITS PRODUCED	MANHOURS EXPENDED (a)			COSTS INCURRED			INCOME
		PROFESSIONAL	NON-PROFESSIONAL	TOTAL	DIRECT (b)	INDIRECT (c)	TOTAL	
1. ACQUISITION AND INPUT OF SOURCE INFORMATION		333	317	650	7,578	9,309	16,887	
a. DOCUMENTS ACQUIRED	4,207 (d)							
b. DOCUMENTS REVIEWED	4,207							
c. DOCUMENTS CATALOGED	547 (e)							
2. TECHNICAL INQUIRY RESPONSES PROVIDED	42	33	19	52	863	661	1,524	620
3. BIBLIOGRAPHIC INQUIRY RESPONSES PROVIDED	–	–	–	–	–	–	–	–
4. HANDBOOKS/DATA BOOKS COMPLETED		1,046	1,857	2,903	23,183	58,154	81,337	71,500.51
a. NEW CHAPTERS/PAGES COMPLETED (g)	7/146							
b. REVISED CHAPTERS/PAGES COMPLETED (h)	2/44							
c. DATA SETS COMPILED	–							
5. STATE-OF-THE-ART STUDIES COMPLETED	–	–	–	–	–	–	–	–
6. CRITICAL REVIEWS AND/OR TECHNOLOGY ASSESSMENTS COMPLETED	–	–	–	–	–	–	–	–
7. CURRENT AWARENESS AND PROMOTION EFFORTS		16	345	361	3,271	4,272	7,543	–
a. NUMBER NEWSLETTERS AND OR ANNOUNCEMENTS PUBLISHED	4							
b. NUMBER MEETINGS, CONFERENCES ETC SUPPORTED (i)	12							
8. OTHER Start-up	–	2,556	918	3,474	41,846	82,757	124,603	–
9. MANAGEMENT AND SUPPORT		251	127	378	7,482	10,333	17,815	
10. UNASSIGNABLE INDIRECT COSTS		--	–	–	–	14,207	14,207	
11 TOTAL		4,235	3,583	7,818	84,223	179,693	263,916	72,120.51

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EDITION OF JUN 72 IS OBSOLETE

Army Materials and Mechanics Research Center
Watertown, Massachusetts 02172
ANNUAL REPORT OF THE
MECHANICAL PROPERTIES DATA CENTER
H. Mindlin, H. Hucek, R. Gubiotti
Battelle-Columbus,
Columbus, Ohio

Technical Report AMMRC TR 80-
March 1980
Contract DLA900-C-0539
January 1 through December 31, 1979

AD ____________

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Key Words
Technical Information Center
DoD Information Analysis Center
Metals
High Strength Metals
Mechanical Properties
Information retrieval

This report summarizes MPDC activities for the period 1 January 1979 through 31 December 1979, a total of 12 months, under Contract DLA900-79-C-0539. It provides a summary of the scope, objectives and organization of MPDC, its information processing products, and services and a discussion of management objectives. The report focuses on the start-up of MPDC and the conversion of the mechanical properties data base to the Battelle data base management system engendered by the change of contractors.

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ACO	DCASMA, Dayton Attn: Administrative Contracting Officer c/o Defense Electronics Supply Center Bldg. #5 Dayton, Ohio 45444
DTIC	Defense Technical Information Center Cameron Station Alexandria, Virginia 22314
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